

## **Petrophysical and Geomechanical Properties of Late Jurassic Carbonates Outcropping in Central Saudi Arabia: Correlation with Depositional Sequences and Diagenetic Overprints**

**Thomas Finkbeiner<sup>1</sup>, Viswasanthi Chandra<sup>1</sup>, and Volker Vahrenkamp<sup>1</sup>**

<sup>1</sup>King Abdullah University of Science & Technology, Thuwal, Saudi Arabia.

### **ABSTRACT**

Late Jurassic carbonates of the Jubaila Formation outcrop in an almost 800 km long escarpment in Central Saudi Arabia. Near Riyadh the formation is exposed along a 1.5 km road cut, which was previously scanned by Saudi Aramco using a high-resolution Lidar survey. Our group has drilled a 37m long core at a location 20 m behind the road cut to investigate the expression of the depositional facies in core, establish diagenesis and the associated paragenetic sequence, document naturally existing fractures and measure petrophysical and geomechanical properties of the rock. Detailed investigations of the facies successions confirm a previously reported shallow water depositional origin and cyclicity similar to that of the prolific Arab reservoirs in eastern Saudi Arabia. Early marine and burial diagenesis to a depth likely exceeding 1 km are indicated by grain micritization, cements, partial dolomitization and pressure solution. However, a reduced porosity and permeability compared to the equivalent oilfield sequences is attributed to a late phase meteoric diagenesis, which likely affected the rock during uplift and exposure. Dual energy CT scans have been found useful for selecting representative rock type samples for further petrophysical studies and in providing 3D models of depositional and diagenetic fabric. Rock mechanical and physical analyses using triaxial tests, continuous scratch testing as well as ultrasonic measurements along the entire core interval provide insight into mechanical stratigraphy and layering that are correlated with lithostratigraphy and diagenetic intervals and are used to further constrain rock types. After characterization of their petrophysical properties through routine and special core analysis the representative rock types are to be utilized for core flood experiments.